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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/729,833	12/06/2000	Pei-Ren Jeng	4425-090	5660

7590

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EXAMINER

LEE, HSIEN MING

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 07/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/729,833

Applicant(s)

PEI-REN JENG

Examiner

Hsien-Ming Lee

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 19 May 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 51-63 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 51-63 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Remarks*

1. The 112-second paragraph rejection to claim 62, 102(e) rejection to claims 51 and 63, 103(a) rejection to claims 52-62 are withdrawn.

### *Double Patenting*

2. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

3. Claims 51-63 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 14, 17, 18, 20, 21, 24-27 of U.S. Patent No. 6,372,660 in view of Muller (US 6,207,517) and Wu (US 6,127,247).

Although the conflicting claims are not identical, they are not patentably distinct from each other because both the Patent and the instant invention claim common subject matters, regardless of obvious variations as explained as follow.

In re claims 51 and 63, US '660 claims the claimed method for forming a dual damascene opening, comprising the steps as recited in claim 14; and further claims "etching through said second dielectric layer and said first dielectric layer until surface of said substrate is exposed by said dense region as an etched barrier layer to patterning said dual damascene", as recited in

claim 24. The subject matter of recitation in claim 24 is equivalent to the "performing" step in claim 51 of the instant invention. In re claim 63, US '660 also claim forming a hard mask layer on said dielectric layer (claim 27, line 44).

Although the Patent does not expressly claim that "the etching rate of said dense region is lower than said second portion of said dielectric layer", it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to comprehend that using "dense region as an etched barrier" (claim 24, line 22, the Patent ) implies that "the etching rate of said dense region is lower than said second portion of said dielectric layer"; otherwise the "dense region" cannot act as "etched barrier."

In re claim 52, US '660 does not claim that "the process of implanting comprises a retrograde implantation."

Muller, however, in an analogous art of forming a dense region in a dielectric layer teaches: providing a substrate 10 (Fig. 1a); forming the dielectric layer 20 on the substrate 19 (Fig. 1a); providing a first photoresist layer 30 on the dielectric layer 20 (Fig. 1b); implanting ions I by using the first photoresist layer 30 as a mask to form the dense (implanted) region 40 (Fig. 1b); and removing the first photoresist layer 30 (Fig. 1c; col. 4, lines 62-63); in which a multiple implantation process is used in the method including three ion implantation steps I1, I2 and I3 into the dielectric layer 20 with gradually increasing implantation concentration profile (col. 5, lines 23-28) as shown in Fig. 2. The dopant used in the multiple implantation process would include a P or B ion (col. 2, lines 40-44). The multiple implantation process of Muller is a retrograde implantation process (col. 6, lines 33-34).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to utilize the retrograde implantation of Muller in the implanting step of US '660 for forming the dense region, since by doing so it would be able to weaken bond structure, which is beneficial to subsequently etching the dense region (col.5, lines 7-11, Muller).

In re claims 53-61, US '660 claims that the implanting comprises a first ion implantation process with a first energy between 20 to 100 KeV (claim 21), the implantation dosage is  $10^{12}$  ~  $10^{15}$  atoms/cm<sup>2</sup> (claim 17), the first ion comprises a boron or a phosphorous ion (claims 18 and 20) but does not claim the energies for a second and third implantation.

Wu, however, in a retrograde implantation process teaches that the first, second and third energies are 100 ~ 1,000 KeV (col.4, lines 36-42), 500 KeV ~ 5MeV (col.5, lines 15-16) and 200 KeV ~ 3MeV (col. Lines 5, lines 24-25), respectively; and the first, second and third implantation doses are  $10^{12}$  atoms/cm<sup>2</sup> ~  $10^{13}$  atoms/cm<sup>2</sup> (col.4, line42),  $5 \times 10^{11}$  atoms/cm<sup>2</sup> ~  $10^{15}$  atoms/cm<sup>2</sup> (col.5, lines 16-17) and  $10^{12}$  atoms/cm<sup>2</sup> ~  $5 \times 10^{13}$  atoms/cm<sup>2</sup> (col.5, lines 25-26), respectively.

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to utilize the specific energies and doses as taught by Wu in the retrograde implantation of US'660 in view of Muller, since by doing it would eliminate additional masking layer for the implantation and avoid outgassing issue in the convention process (col.3, lines 1-3, Wu), which, in turn, would reduce manufacturing cost (col.2, lines 16-21, Wu).

In re claim 62, the selection of the etched selectivity between the dense region and the dielectric layer is obvious to one of the ordinary skill in the art because it is a matter of

determining optimum process condition by routine experimentation to selectively etch the predetermined etched region without damaging rest portions of the dielectric layer. In this case, the originally filed specification fails to demonstrate the criticality as to why the etched selectivity has to be about 2 for achieving unexpected results. See M.P.E.P. 2144.05 III.

***Conclusion***

4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-Ming Lee whose telephone number is 703-305-7341. The examiner can normally be reached on M-F (9:00 ~ 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the

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organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Hsien-Ming Lee  
Examiner  
Art Unit 2823



July 23, 2003

W. DAVID COLEMAN  
PRIMARY EXAMINER

